BIOL 240 - General Zoology Course Outline

Approval Date: 3/10/2022
Effective Date: 8/11/2023

SECTION A

Unique ID Number	CCC000085469
Discipline(s)	Biological Sciences
Division	Science and Engineering
Subject Area	Biology
Subject Code	BIOL
Course Number	240
Course Title	General Zoology
TOP Code/SAM Code	0407.00 - Zoology, General / E - Non-Occupational
Rationale for adding this course to the curriculum	1. Updating math prerequisite to remove the discontinued MATH 94 and replace it with "MATH 95, Intermediate Algebra or equivalent placement." This language is consistent with recently approved changes to the math prerequisite for CHEM 120, which is a prerequisite for this course. 2. Changing the course schedule to replace the 1-hour discussion with a second, weekly 3-hour lab. This reverts back to the original schedule for this class, is consistent with other 200-level biology lab courses, and is needed in order to adequately cover the lab content in the class. This will be especially necessary with the likely reduction of the semester length from 18 to 16 weeks. This change does not alter the course unit count. 3. Adding Hybrid option to course delivery methods and additional DE information which describes online instructional methods. 4. Updating textbooks to new editions.
Units	5
Cross List	*N/A*
Typical Course Weeks	18

Total Instructional Hours

	Contact Hours
Lecture	54.00
Lab	108.00
Activity	0.00
Work Experience	0.00
Outside of Class Hours	108.00

Total Contact Hours	162
Total Student Hours	270
Open Entry/Open Exit	No

Maximum Enrollment	
Grading Option	Letter Grade or P/NP
Distance Education Mode of Instruction	On-Campus Hybrid

SECTION B

General Education Information:

SECTION C

Course Description

Repeatability	May be repeated 0 times
Catalog Description	An integrated course in zoology and organismal biology, emphasizing the anatomy, physiology, development, diversity, and evolutionary relationships of animals. Major topics include comparative study of major animal phyla, principles of evolution, genetics of organisms and populations, mechanisms of animal development, and structure-function relationships in animals. Intended for biology majors.
Schedule Description	

SECTION D

Condition on Enrollment

1a. Prerequisite(s)

- BIOL 120 with a minimum grade of C or better and
- CHEM 120 with a minimum grade of C or better and
- Intermediate Algebra, MATH-95, or appropriate placement.

1b. Corequisite(s): *None*

1c. Recommended: *None*

1d. Limitation on Enrollment: *None*

SECTION E

Course Outline Information

1. Student Learning Outcomes:

A. Characterize the major animal phyla and compare their basic anatomy.
B. Articulate the principles of Darwinian evolutionary theory.
C. Relate structure to function in the vertebrate organ systems.

2. Course Objectives: Upon completion of this course, the student will be able to:

A. Trace the evolutionary history of animal life from the Cambrian Period to the present and correlate major milestones in the evolution of vertebrate animals with the geologic time scale.
B. Describe important aspects of animal body organization including symmetry, germ layers, body cavities, segmentation, appendages, and organ systems in the major animal phyla.
C. Articulate the principles of Darwinian evolutionary theory and present lines of evidence for macroevolution and microevolution.
D. Outline current understanding of phylogeny of major animal groups.

E. Compare the anatomy of the chordate classes and identify homologous structures in different classes and different organ systems.
F. Distinguish various embryonic stages of the sea star and frog, and compare these to the early embryos of birds and mammals.
G. Discuss the regulation of animal development at the molecular, cellular, and higher levels of organization.
H. Demonstrate the relationship between biological structure and function using specific examples from the vertebrate organ systems.
I. Describe how information is processed and transmitted in the vertebrate nervous system.
J. Distinguish between innate and learned behaviors and describe examples of each in animal communication.
K.

3. Course Content

1. Lecture Topics
   A. Overview of animal diversity and evolutionary history
      a. Geologic time scale and animal evolution
      b. Mass extinctions
      c. Cenozoic radiation of mammals, birds and insects
   B. Animal body plans
      a. Levels of biological organization
      a. Radial and bilateral symmetry
      c. Body cavities
   C. Evolution
      a. Evolution by natural selection
      b. The fossil record
      c. Biogeography
      d. Homology
      e. Experimental evidence of evolution
      f. Speciation
   D. Phylogeny
      a. Major animal clades
      b. Phylogenetic analysis
   E. Genetics of organisms and populations
      a. Mendelian genetics
      b. Chromosomal genetics, linkage and recombination
      c. Population genetics
   F. Animal development
      a. Early embryonic stages and processes
      b. Comparative embryology of a sea star, frog, bird, and mammal
      c. Regulation of development: induction and regulatory genes
      d. Pattern formation in Drosophila and vertebrate limb development
   G. Chordate evolution and morphology
      a. Chordate characteristics
      b. Early vertebrates
      c. Origin of tetrapods
      d. Evolution of amniotes and reptilian diversity
      e. Evolution and functional morphology of mammals
   H. Animal form and function
      a. Functional requirements and exchange processes

b. Animal tissues
c. Homeostasis
d. Thermal and energy relations of animals

I. Physiology of vertebrate organ systems
a. Skeletal system
b. Muscular system
c. Digestive system
d. Circulatory systems
e. Respiratory systems
f. Excretory systems and osmoregulation

J. Control and integration
a. Neurons and neural signaling
b. Vertebrate nervous system
c. Endocrine signaling

K. Introduction to animal behavior
a. Ethology
b. Innate and learned behaviors
c. Animal communication

2. Laboratory Topics and Activities

A. Animal classification and phylogeny
a. Taxonomic hierarchy and biological nomenclature
b. Phylogenetic classification

- construct cladograms of selected invertebrate and vertebrate animals

B. Detailed study of major animal phyla
a. Porifera and Cnidaria

- study representative specimens of sponges and cnidarians
- diagram the canal system of a syconoid sponge
- diagram the life cycle stages of a hydrozoan cnidarian
- collect acontia from a live anemone and observe firing of nematocysts

b. Platyhelminthes, Nematoda and Annelida

- characterize basic anatomy of each phylum and relate form to function
- diagram life cycles of a liver fluke and a tapeworm
- earthworm dissection

c. Mollusca

- study live and preserved mollusks and mollusk shells
- compare functional anatomy of bivalve, gastropod, and cephalopod mollusks
- squid dissection

d. Arthropoda

- identify important features of the arthropod body plan
- study and characterize representative specimens of arachnids, crustaceans, myriapods and insects
- crayfish dissection
- identify major insect orders and compare external morphology
- discuss life cycles, adaptations, and ecological interactions of various insects

e. Echinodermata

- study preserved and live echinoderms
- diagram the water vascular system of a sea star
- compare digestive system structure of a sea star and a sea urchin

f. Chordata

- identify key chordate characteristics on slides of invertebrate chordates

- diagram phylogeny of the vertebrate classes and compare representative specimens
- compare anatomy of a shark and a bony fish
- identify diverse types of reptiles, birds and mammals
- describe morphological adaptations for swimming, flying and terrestrial locomotion in different vertebrate classes

g. Field Trip to the Coast

- observe intertidal and marine animals in a protected harbor and along the exposed coastline
- characterize zonation patterns of intertidal animals
- discuss specific adaptations for life in the intertidal zone

C. Animal development

a. Embryology of the sea star

- identify stages of early sea star development on slides

b. Embryology of the frog

- identify stages and structures of the frog embryo

c. Development of the vertebrate body plan

- relate embryonic structures in the frog and chick embryo to the vertebrate body plan

D. Vertebrate Form and Function

a. Vertebrate skeleton

- identify major bones on mounted and disarticulated skeletons
- recognize skeletal homology in diverse mammal skeletons
- compare skull morphology and dentition in herbivorous, carnivorous and omnivorous mammals

b. Functional anatomy of mammals: Fetal pig dissection and study of human anatomical models

1. Muscular system
2. Digestive and respiratory systems
3. Circulatory systems
4. Urogenital systems

4. Methods of Instruction:

Discussion: Instructor-guided discussion of lecture topics and selected reading assignments.
Field Trips: Class field trip to Bodega Marine Laboratory
Lab: Observation and inquiry-based study of animal diversity, embryology, functional anatomy and physiology
Lecture: Spoken lectures with visual media, diagram handouts, and interactive question and discussion
Online Adaptation: Discussion, Lecture
Explain how the online adaptation of the methods of instruction aligns with the course outcomes: Online lectures will use instructor-narrated Powerpoint presentations supplemented with detailed lecture outlines posted weekly on the course Canvas website. The lectures will closely follow the course content outline and course objectives which are directly aligned with the course learning outcomes. Online discussions will serve to engage student participation and explore certain topics in greater depth with selected reading assignments.

2. Methods of Evaluation: Describe the general types of evaluations for this course and provide at least two, specific examples.

Typical classroom assessment techniques

Exams/Tests -- Midterm exams (2-3) consist of multiple choice, short answer, and essay questions on material covered in the lectures. Example: Midterm 1 covers animal origins, Darwinian evolution, speciation, and genetics of organisms and populations.

Quizzes -- Lecture quizzes consist of multiple choice and short answer questions. Lab quizzes cover material assigned in previous labs or procedures for the current lab.
Papers -- 1. Short reports on reading assignments and field trip observations. 2. Term report.
Lab Activities -- 1. Written answers to questions assigned with the laboratory exercises. 2. Practical lab exams (3-4) emphasizing identification of animal specimens, structures and questions on animal form and function. Example: Lab Exam 1 covers identification and anatomy of the phyla Porifera, Cnidaria, Platyhelminthes, Nematoda, Annelida, and Mollusca.
Final Exam -- Cumulative final exam consists of multiple choice, short answer, and essay questions on material covered over the entire course, with greater emphasis on animal form and function.
Mid Term -- See Exams/Tests above.

Letter Grade or P/NP

3. Assignments: State the general types of assignments for this course under the following categories and provide at least two specific examples for each section.

A. Reading Assignments
   1. Reading assignments from the textbook and laboratory manual as specified in the course syllabus.

   2. Additional reading from scientific journals and excerpts from scientific texts.

   Example 1:
   Read Campbell Biology chapter on Darwinian evolution by natural selection.

   Example 2:
   Read Chapter 3: "Handy Genes" from the book "Your Inner Fish" in preparation for class discussion on the regulation of limb development in vertebrates.

B. Writing Assignments
   1. Term Report

   2. Short reports on reading assignments and the field trip.

   Example 1: Term report or annotated biliography.
   Write a detailed report or annotated bibliography on zoological topic appropriate to the class and approved by the instructor. The report must cite at least two primary references from the scientific literature in addition to online sources, book chapters and/or review articles, and must use proper citation format.

   Example 2: Field trip report.
   Following the field trip to Bodega Bay, write a two-page report that describes adaptations to the challenges of the intertidal zone, focusing on two species that you observed during the field trip.

C. Other Assignments
   1. Answers to questions assigned for each lab exercise.

   Example 1: Lab 4 questions.
   1. Describe and compare the functions of the mantle and the mantle cavity in a clam and in a squid.
   2. Define cephalization and rank the classes of mollusks studied in the lab from lowest to highest degree of cephalization.

3. Diagram the water flow pattern through the mantle cavity of a marine snail, showing the incurrent and excurrent flows.
4. What structures function to close the valves of a clam shell? What structure opens the valves?
5. Describe how a clam burrows into sand or mud. What specific muscle(s) does it use?
6. Make a table of several species you studied in lab that divides them into the following groups: ciliary-mucoid filter feeders, radular grazers, active predators.

4. Required Materials

A. EXAMPLES of typical college-level textbooks (for degree-applicable courses) or other print materials.

Book #1:

Author:	Urry, L.A., et al
Title:	Campbell Biology
Publisher:	Pearson
Date of Publication:	2020
Edition:	12th

Book #2:

Author:	Hickman, C.P., et al
Title:	Integrated Principles of Zoology
Publisher:	McGraw-Hill
Date of Publication:	2020
Edition:	18th

Book #3:

Author:	Hickman, C.P., et al
Title:	Laboratory Studies in Integrated Principles of Zoology
Publisher:	McGraw-Hill
Date of Publication:	2020
Edition:	18th

B. Other required materials/supplies.